FLUKE
TROUBLESHOOTER
VOL.3 NO.2 FOR MICRO-SYSTEM TROUBLESHOOTER USERS

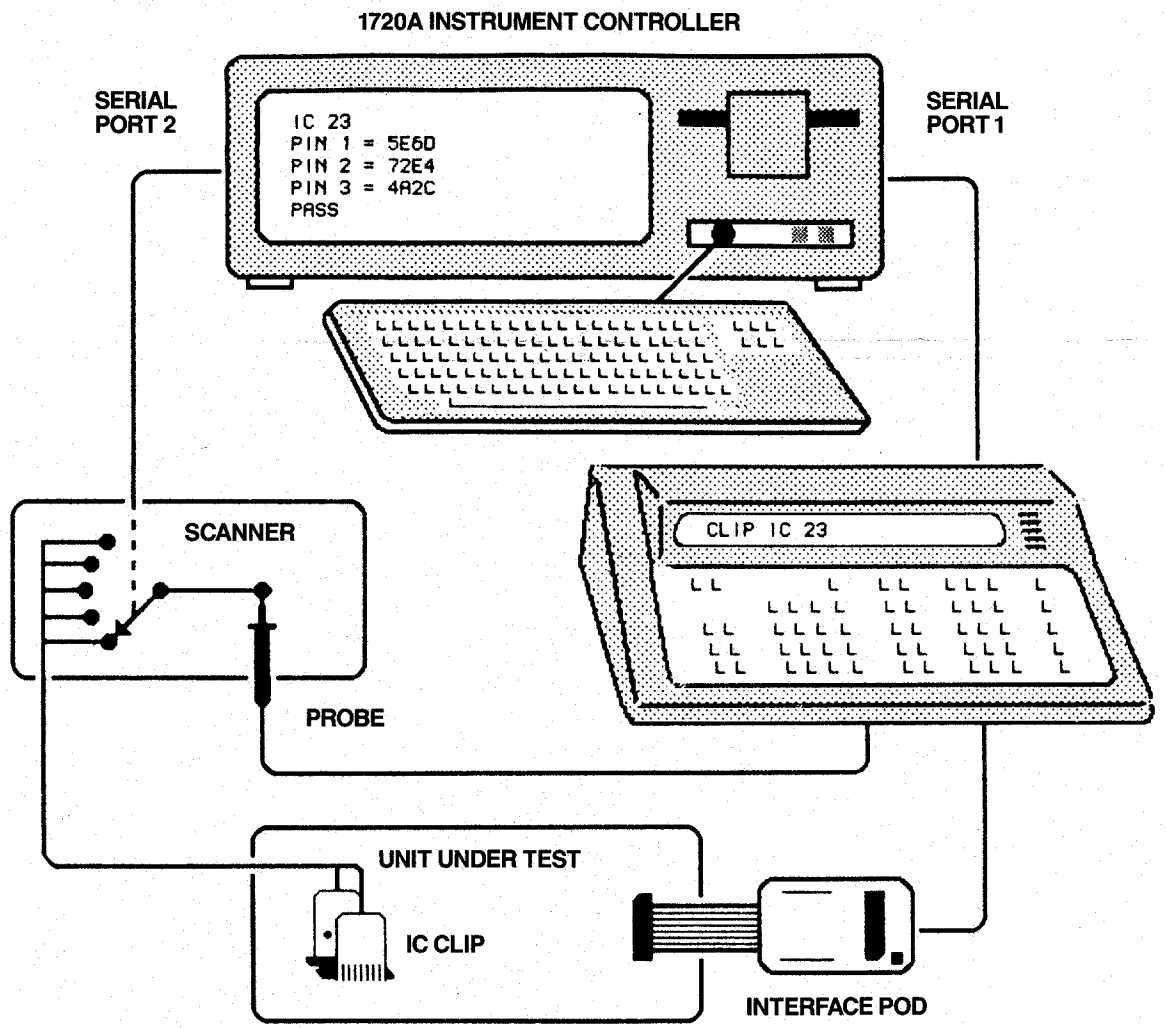

Figure 1.

A scanner for multipoint probing

by Ed Ferguson

Part 2

In Volume 2, Issue 1 of the TROUBLESHOOTER (reprinted in the 1984 ANNUAL edition), I wrote an article that described a scanner circuit to multiplex up to 24 inputs to the 9010A's probe. The scanner was controlled from the 9010A's RS-232 interface to select a given input from an IC clip or board edge connector, and routed the high, low, or tristate levels from the selected input to the 9010A probe. A sample 9010A program showed a method to automatically probe and compare the signature at each pin of an IC.

In the second part of this article I have expanded upon this system to show that with the addition of a personal computer you can now "learn" as well as test a UUT, one IC at a time. By using a good UUT, the computer can store the date gathered from each IC and record this data for later comparison with faulty UUTs.

Any computer with two serial ports and a floppy disk can be used. Serial port 1, connected to the 9010A, selects the stimulus program and reads the resulting probe data. Serial port 2 connects to the scanner and just selects the probe's input. The floppy disk stores the probe data gathered at each pin of each IC. The system shown in fig. 1. uses a Fluke 1720A Instrument Controller with a menu driven program written in BASIC. The software:

1. Learns the signature, count, or level history at each pin of an IC.
2. Tests a given IC.
3. Displays a list of failed IC's and their pin numbers.

(continued on next page)

Scanner...

(continued from cover)

Basic Program

The computer's program contains a disk array to store the data for each IC. The array contains the IC number, the number of pins, the 9010A stimulus program number and the probe data for each pin.

When "learning" a good UUT, the computer will prompt the operator to clip on to an IC and enter its number. The program then looks in the array for the IC pin count and the stimulus program number. It begins a loop at line 500 which ranges from 1 to the total number of pins. Lines 510-530 convert the IC pin number to the hex data required by the scanner. The pin numbers are shifted at line 520, as required, so a single 16 pin IC clip will work with all ICs having 16 pins or less.

Next, the program triggers the 9010A to execute the proper stimulus program. The 9010A reads the probe and sends the probe data to the computer. The computer then strips the signature from the probe data and stores the IC number, pin number, and signature in the array. This process is repeated until the pins on all ICs are learned. The program takes several probe readings at each pin to insure that the signatures are repeatable. If they are not, a count or level may be stored instead.

The troubleshooting philosophy is to first test the UUT kernal (BUS, ROM, RAM) using the 9010A alone. To test the UUT beyond the kernal, the "learn" steps are repeated except that the actual signatures are now compared to those stored on disk, and any discrepancies are displayed. You may wish to design the program so that the operator enters the IC number to test, or allow the program to guide the operator by adding the necessary logic.

9010A Program Description

The following description is for the 9010A. If using a 9020A, it will be remotely programmed by the computer simplifying the interface used. The 9010A main program (Program 0) inputs the desired stimulus program number (1-3) from the computer, executes it and can be expanded, if needed, to handle more stimulus programs.

9010A Main Program (Program 0)

```
0: LABEL 0                      ! loop until a valid stimulus program
   AUX/1                        ! number (1-3) is received from
   IF REG 1 = 1 GOTO 1          ! computer port 1.
   IF REG 1 = 2 GOTO 2
   IF REG 1 = 3 GOTO 3
   GOTO 0                       ! did not receive a valid program number
1: LABEL 1
   EXECUTE PROGRAM 1            ! stimulus program for IC 1
   GOTO 0
2: LABEL 2
   EXECUTE PROGRAM 2            ! stimulus program for IC 2
   GOTO 0
3: LABEL 3
   EXECUTE PROGRAM 3            ! stimulus program for IC 3
   GOTO 0
```

A stimulus program:

- exercises the circuit under test;
- sends the probe data to the computer; and
- must be written on the 9010A for each circuit under test before learning the UUT.

Program 1 is a sample of a stimulus program.

9010A Stimulus Program For IC1 (Program 1)

```
SYNC DATA                       ! syncronize probe
READ PROBE                      ! clear probe data
RAMP @ 2001                     ! stimulus for IC under test
READ PROBE                      ! read probe data
DPY-$0                          ! display probe data on 9010A
AUX-$0                          ! send probe data to computer port 1
```

Space does not permit a full listing of BASIC program, however the routine below shows the steps to close the scanner switch, select the 9010A stimulus program, and input the probe data.

```
10   ! PN    is number of IC pins
20   ! SW    is scanner switch 1-24
30   ! ST    is 9010A stimulus program 1-3
40   ! PD$   is 9010A probe data
•
•
500  FOR L = 1 TO PN                ! begin loop
510  LET SW = L
520  IF L > PN/2 THEN LET SW  = L + 2*(8-PN/2)
530  PRINT #3, CHR$ (31 + SW)       ! close scanner switch (port 2)
540  PRINT #2, CHR$ (ST);           ! select 9010A stimulus program
                                    ! (port 1)
550  INPUT #1, PD$                  ! input probe data from 9010A
                                    ! (port 1)
•
•
```

Compiler gets programs working sooner

by Lee Molho

Marcus Information Systems, Santa Monica, California

The 9010A Language Compiler lets you write test programs that are easy to read. Abundant evidence shows that programs which are easy to read are easier to understand, easier to debug, and easier to change later on, compared with hard-to-read programs. Here's an example:

"PROBELEVEL" is a subroutine that is going to take care of details of reading logic levels with the 9010A probe. All a calling program will need to do is tell PROBELEVEL the level it expects to find, EXECUTE PROGRAM PROBELEVEL, and look for a "true" or "false" response. Because the 9010A Language Compiler lets us name registers, let's call the level that is wanted "WANTLEVEL", the true-or-false response "VALIDITY", and assign registers to them. Since those registers are used to pass values between programs, we must use two of the global registers by writing declarations in the main program like, "ASSIGN REG8 TO WANTLEVEL" and "ASSIGN REG9 TO VALIDITY."

What we've just done is to specify our program by defining its input and output. Now, take a look at the listing of a working version of PROBELEVEL.

At the beginning, a comment tells what the program does. Meaningful names are chosen for labels and registers. Step by step, comments explain what is going on and what we think the program is doing. We put those in when the program is fresh in our mind; later, they will explain the program when a problem shows up.

Even though it is short, PROBELEVEL contains a multilevel branching structure. If your program didn't seem to work quite right, which would you rather debug—the Language Compiler version, or the 9010A keyboard Program 9.

Program Probelevel

```
! ENTER WITH "PROBE U#—#" IN DISPLAY, WANTLEVEL = 0, 1, or 99 (99 = FLOAT).
! RETURNS 0 (= FALSE) OR 1 (= TRUE) IN VALIDITY.
! TESTS FOR AND EXPECTS LEVELS, NOT PULSES.
! WANTLEVEL AND VALIDITY ARE GLOBAL REGISTERS DECLARED IN MAIN PROGRAM.
DECLARATIONS                              ! LOCAL ONLY
    ASSIGN REG0 TO PROBEVAL
    ASSIGN REG1 TO ANSWER
! END DECLARATIONS; START OF PROGRAM

    SYNC FREE—RUN                         ! INITIALIZE PROBE MODE.
    DPY — +, CONT WHEN READY              ! CONCATENATES WITH U#—#.
    STOP
BEGINPROBE:
    READ PROBE                            ! DO TWICE. SEE 9010
                                          ! PROGRAMMING
    READ PROBE                            ! MANUAL P. 5-13.
    VALIDITY = 0                          ! SET VALIDITY FALSE, PROVE
                                          ! TRUE.
    IF PROBEVAL = 4000000 GOTO GOTLOW     ! THESE VALUES REQUIRE
                                          ! THAT THE
    IF PROBEVAL = 1000000 GOTO GOTHIGH    ! PROBED NODE BE A
                                          ! STABLE LEVEL
    IF PROBEVAL = 2000000 GOTO GOTFLOAT   ! MAYBE NOT READY IF NOT
                                          ! STABLE:
    DPY—PROBE LEVEL UNSTEADY. RETRY?1     ! ENTER = RETRY,
                                          ! CLEAR = EXIT.

    IF ANSWER = 1 GOTO  BEGINPROBE        ! ELSE,
    GOTO  RETURNFALSE                     ! IF HE'S READY, IT'S
                                          ! BAD.
GOTLOW:
    IF WANTLEVEL = 0 GOTO RETURNTRUE      ! ELSE,
    GOTO  RETURNFALSE
GOTHIGH:
    IF WANTLEVEL = 1 GOTO RETURNTRUE      ! ELSE,
    GOTO  RETURNFALSE
GOTFLOAT:
    IF WANTLEVEL = 99 GOTO RETURNTRUE     ! ELSE,
    GOTO  RETURNFALSE
RETURNTRUE:
    VALIDITY = 1
RETURNFALSE:                              ! IT'S FALSE ALREADY.
```

Program 9

```
SYNC FREE-RUN
DPY — +, CONT WHEN READY
STOP
LABEL 0
READ PROBE
READ PROBE
REGD = 0
IF REG0 = 4000000 GOTO 1
IF REG0 = 1000000 GOTO 2
IF REG0 = 2000000 GOTO 3
DPY-PROBE LEVEL UNSTABLE. RETRY?1
IF REG1 = 1 GOTO 0
GOTO 4
LABEL 1
IF REGC = 0 GOTO 5
GOTO 4
LABEL 2
IF REGC = 1 GOTO 5
GOTO 4
LABEL 3
IF REGC = 99 GOTO 5
GOTO 4
LABEL 5
REGD = 1
LABEL 4
```

Support services for the Troubleshooter

by Ed Ferguson

Fluke's Customer Support Group offers a variety of support services for your Micro-System Troubleshooter. Within the United States we offer a **Pod Exchange Program, Standard Price Repair, Service Agreements and a toll free number for ordering Service Parts.** Similar programs may be available outside the United States. Contact your Fluke International Representative for information.

Pod Exchange

The Fluke Module Exchange Program can reduce your 9000A pod downtime to one work day. For a reasonable price we will exchange a pod assembly (complete pod minus the case) for your defective pod assembly. Simply install the assembly in your original serial-numbered case and return the defective assembly to us. Our inventory of previously used pod assemblies are maintained to the latest revisions and are warranted for 90 days.

Here's how it works: within the United States, call your nearest Fluke Technical Center and order a replacement pod. It will be sent prepaid from Everett, Washington, via an overnight carrier. Typically your replacement will arrive within 24 hours. Return the defective pod in the prepaid reusable shipping container within 15 days.

Technical Center Repair

Your Troubleshooter and pod may be repaired at any Fluke Technical Center listed in your Service Manual. Each Technical Center is equipped with the necessary instruments, standards, procedures and personnel to maintain your Troubleshooter at peak performance. All repairs are warranted for 90 days.

A Standard Price Program is available through all U.S. Fluke Technical Centers. This program simplifies the service transaction by establishing a fixed charge for normal repairs. See the list below for current prices.

Technical Center Service Agreements

Service agreements are available through all U.S. Fluke Technical Centers. A service agreement will cover all maintenance costs for one year. The fixed-annual price includes all parts, labor and return shipping costs. Current prices are shown.

Service Parts

Fluke maintains an extensive inventory of replacement parts to service your Troubleshooter. You may order parts directly through our Parts Department in Everett, Washington at 1-800-526-4731 (356-5774 in Washington State). We accept Mastercharge, Visa or a purchase order. The minimum order is $10.00. Please identify parts by the Fluke six-digit part number, the instrument model and serial number and a description of the part as shown in your Service Manual.

U.S. Fluke Technical Centers

Burbank, CA	(213) 849-4641
Everett, WA	(206) 356-5560
Denver, CO	(303) 695-1171
Santa Clara, CA	(408) 727-8121
Rolling Meadows, IL	(312) 398-5800
Dallas, TX	(214) 869-0311
Burlington, MA	(617) 273-4678
Paramus, NJ	(201) 262-9550
Rockville, MD	(301) 770-1576
Orlando, FL	(305) 896-4881

Support Services Price List – May 85

Troubleshooter Model	Standard Repair Price	Annual Service Agreement
9005A	$222	$140
9010A	242	176
9020A	252	172

Interface Pod	Exchange Price	Annual Service Agreement
9000A-100/AG	$225	$ 50
9000A-1802	295	84
9000A-6502	270	60
9000A-6800	270	60
9000A-68000	325	84
9000A-6802	270	60
9000A-6809	270	84
9000A-8048	295	84
9000A-8051	325	116
9000A-8080	270	60
9000A-8085	270	60
9000A-8086	325	116
9000A-8088	325	116
9000A-80186	325	116
9000A-80188	325	116
9000A-9900	295	84
9000A-Z80	270	60
9000A-Z80/AA	270	84
9000A-Z8000	325	84

U.S. only—prices subject to change

Advanced training schedule

The current world-wide Advanced Training Schedule is listed below. Contact your local Fluke Sales Office or Representative for prices and registration details.

Remember, we recommend that anyone attending the Advanced Training seminar first attend a free Introductory Training class. Contact your local Fluke Sales Office or Representative for Information on the Introductory Training seminars.

Advanced Training Schedule

Atlanta, GA	Jun 18–19	'85
London, England	Jul 1–12	'85
Orlando, FL	Jul 16–17	'85
Baltimore, MD	Jul 30	'85
Tilburg/Brussels	Aug 19–23	'85
Burlington, MA	Sep 27–28	'85
London, England	Sep 9–20	'85
Paramus, NJ	Sep 10–11	'85
Eastern Canada*	Sep 24–25	'85
Detroit, MI	Oct 8–9	'85
Rolling Meadows, IL	Oct 22–23	'85
Minneapolis, MN	Nov 12–23	'85
Seattle, WA	Dec 3–4	'85
Western Canada*	Jan 7–8	'86
San Jose, CA	Jan 21–22	'86
Los Angeles, CA	Feb 4–5	'86
San Diego, CA	Feb 25–26	'86
Phoenix, AR	Mar 11–12	'86
Dallas, TX	Mar 25–26	'86
Atlanta, GA	Apr 8–9	'86
Orlando, FL	Apr 22–23	'86
Baltimore, MD	May 6–7	'86
Burlington, MA	May 20–21	'86
Paramus, NJ	Jun 10–11	'86
Eastern Canada*	Jun 24–25	'86
Detroit, MI	Jul 15–16	'86
Rolling Meadows, IL	Jul 29–30	'86
Minneapolis, MN	Aug 19–20	'86
Seattle, WA	Sep 16–17	'86
Western Canada*	Sep 30–Oct 1	'86
San Jose, CA	Oct 21–22	'86
Los Angeles, CA	Nov 4–5	'86
Phoenix, AZ	Nov 18–19	'86
Austin, TX	Dec 9–10	'86

*Call (416)678-1500 for more info

User group happenings

by Phyllis Levy

User Groups are continuing to grow in popularity. The six groups currently active in the United States are meeting in:

Minneapolis, MN
Cedar Rapids, IA
Dallas, TX
Atlanta, GA
Las Vegas, NV
Chicago, IL

Each group's organization and discussions vary depending on the participants' work and skill level. The group meeting in Las Vegas is a good example. These meetings are only open to people who work independently, or for the gambling casinos, servicing slot machines. This type of membership restriction gives the participants total freedom to discuss confidential information.

The Las Vegas group has been meeting monthly and welcomes all who meet the membership criteria.

The groups meeting in Minneapolis and Cedar Rapids have a different focus. Their members work primarily in the electronics field, and due to their geographical proximity, meet on consecutive days each quarter. This allows the two groups to share the same programs and visiting speakers.

In the past, discussions have ranged from technical applications of the 9000 Series to product demonstrations. In January, Ron Brittain, Fluke's Sales Support Manager from Everett, WA., visited the Minneapolis and Cedar Rapids meetings. Mr. Brittain gave a demonstration of Test Writer, a new software package for guided fault isolation routines. Their following meeting, in April, featured a presentation on using Assembly language to download test routines and there was a discussion of using "RUN UUT" as a testing aid.

In the future these two groups are planning to have a series of lectures focusing on the probe and its uses. There are also plans to start a reference list of users categorized by what pods they are working with, and to create a software library for group members to use.

Dallas' User Group has organized each meeting by presenting two technical topics at each meeting. One was given by a Fluke representative and the other by a member of the User Group. Due to personnel changes, this group is going through some reorganization but still intends to continue meeting.

In Atlanta, due to the diversity of the group's members, a wide variety of subjects have been covered. Topics have included using the 9010A to troubleshoot instruments that contain bubble memory, testing and troubleshooting programmable interface chips and a general discussion of RS232 serial interfaces.

Our newest group is in Chicago. Their first meeting was in February and things have gotten off to a good start drawing people from the communications, hospital and electronics industries. Technical presentations have been given by both Fluke people and members of the User's Group. June 18th is the date set for their next meeting.

Call your local Fluke Sales Office to find out when the next meeting of the above groups will be held or to see if there are plans to form a User's Group in your area.

Back issues available

Each year we publish an edition of The Troubleshooter that contains all the application articles published during the year. There are now two Troubleshooter Annuals available:

1983 Troubleshooter Annual
1984 Troubleshooter Annual

If you missed any editions during either of these years, you are missing information that might help you when using the 9010A, 9005A or 9020A.

Contact your local Sales Office to receive copies of these editions.

Get a free Fluke 77 handheld multimeter

In every issue of the TROUBLESHOOTER we included an article offering a free Fluke 77 Multimeter—and this issue is once again repeating the offer. How can you get one? Write an article for the TROUBLESHOOTER and have it published. At this time, new customer-written articles are being reviewed.

What do we need? Articles you feel will be of interest to other users. The language compiler story submitted by Lee Molho in this issue of the TROUBLESHOOTER is a good example. Subjects of interest might include:

- Solutions to particular troublesome testing problems.
- Unique troubleshooter applications.

Articles should be submitted to:

Troubleshooter Editor
John Fluke Mfg. Co., Inc.
M/S 267-D
P.O. Box C-9090
Everett, WA 98206

Published articles will carry your name and your company's name in the by-line. In addition, when the article is published, you will receive a free Fluke 77 Handheld Multimeter.

9010A application support

The following individuals and organizations have indicated their capabilities of, and interest in, providing independent 9010A support. The services offered are shown with each name.

If you would like your name added to the list, please let us know.

Ernest Flamont
Rayfran, Inc.
23920 Freeway Park Drive
Farmington Hills, MI 48024
(313) 476-4980
Contract manufacturing, burn-in, programming, testing and troubleshooting.

Keith Ainsley
First Source Limited
360 Croxley View
Watford, Herts
WD1 8PR
England
Tel: (0923) 26087
Programming for 9010A

Alan C. Naisuler
7 Robbins Rd
Lexington, MA 02173
(617) 861-6473
9010A/9020A software development, digital hardware design and analog circuit design

Harry Bar
Polar Software Systems
Reitseplein 9
5037AA Tilburg
The Netherlands
Tel: 013-633955
System and pod adapter development, and training.

Kjell Moum
Microtema A.B.
Angsullsvagen 62
16246 Vallingby
Sweden
Tel: 08-760 55 63
Developing pod adapters, small systems and test programs on the 9010A/9020A.

IFE Electronics
Moossfrasse 8
2545 Sel Zach
Switzerland
065-611573

Mr. Ali Mosieh
Computer Service Corp.
8300 Merrifield Ave.
Fairfax, VA 22031
(703) 560-5051 (office)
(703) 560-1316 (home)
Contract programming and troubleshooting.

Mr. Gary Aiken (Eng. Manager)
Diversified Data Corp.
6551 Loisdale Court
Springfield, VA 22150
(703) 922-9444
Contract programming, engineering support, integrated logistics support, documentation, and training.

Mr. Allan Cody
Electronics Corp. of America
1 Memorial Dr.
Cambridge, MA 02142
(617) 787-5980
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Mr. Thomas Bielecki
EMF Inc.
60 Foundry St.
Keene, NH 03431
(603) 352-8400
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Mr. Dick Thomas
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5096 Peachtree Rd.
Chamblee, GA 30341
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Mr. Quint Pierson
General Electric Co.
Schenectady Instrument Service
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Schenectady, NY 12345
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Mr. Julio Cordova
High-Technology Services
1301 W. Copans Rd., Bldg. F
Pompano Beach, FL 33064
(305) 973-4949
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Mr. Mike Pearson
Mike Pearson & Associates
2013 Tiehick Lane
Garland, TX 75234
(214) 495-4510
Contract programming, testing, and troubleshooting.

Mr. John Schira
Quinton Instruments
2121 Terry Ave.
Seattle, WA 98121
(206) 223-7373
Contract programming.

Mr. A. Gallagher (System Eng.)
Wismer & Becker Engineers
7820 Folsom Blvd.
Sacramento, CA 95806
(916) 381-3930 Ext. 475
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Mr. Dennis D. Norwood
O'Conner Distributing Co. Inc.
9030 Directors Row
Dallas, TX 75247
800-527-2432 Outside Texas
800-442-6586 Texas
Contract programming, testing and troubleshooting video games.

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